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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/751,172	12/30/2003	Jae-Won Han	OPP 031047 US	3390

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EXAMINER	
NGUYEN, HA T	

ART UNIT	PAPER NUMBER
2812	

DATE MAILED: 12/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/751,172	HAN, JAE-WON	
	Examiner	Art Unit	
	Ha T. Nguyen	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 September 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9-14 and 17-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7, 9-14, 17-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's Amendment and Response to the Office Action mailed 6-29-5 has been entered and made of record .

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-2, 9, and 12-14, 17-18, and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamanaka (USPN 6337272).

Referring to Figs. 1A-2B and corresponding text, Hamanaka discloses [Re claim 1] a method of manufacturing silicide, comprising the steps of : (a) cleaning a semiconductor substrate with a transistor formed thereon, the transistor including a source electrode, a drain electrode and a gate electrode (b) placing the cleaned semiconductor substrate into a sputter chamber in a deposition equipment, and forming silicide at the same time of depositing a metal film under a state where the semiconductor substrate is heated at a temperature from 200 to 500C (see col. 2, lines 25-42), approximately 450C(see par. bridging cols. 9-10) ; (c) removing residual metal film not used for the formation of silicide; and (d) annealing the semiconductor substrate (see col. 8, lines 7-60 and col. 9, line 40-col. 10, line 13). But it fails to disclose expressly the claimed temperature range. However, in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists (See MPEP 2144.05).

[Re claims 9 and 17] Hamanaka discloses substantially the limitations of claims 9 and 17, as shown above. But it fails to disclose wherein the step (b) comprises sputtering cobalt at a DC power of 2-10kW. However, the power used depends on the desired rate of deposition, which changes with the requirements of a specific application.

[Re claims 2 and 18] Hamanaka also discloses wherein , in the step (b), the silicide comprises CoSi (see col. 9, line 15-col. 10, line 13);

[Re claims 14 and 23] wherein, after the step (d) the silicide comprises CoSi2 (see col. 9, line 15-col. 10, line 13);

[Re claims 12 and 21] wherein , the step (d) includes heating the semiconductor substrate during a predetermined duration at a temperature of more than 500C in a RTP equipment (see col. 5, lines 40-62). The arguments regarding overlapping ranges stated above also apply.

[Re claims 13 and 22] Hamanaka fails to discloses wherein the step (d) includes heating the semiconductor substrate for 20-60 minutes at a temperature of 500-900C in an electric furnace. However, the examiner takes Official Notice annealing in a furnace is conventionally done, the duration of the annealing depend on the thickness of the layer to be silicided and the temperature of the annealing.

Therefore, at the time of the invention, it would have been obvious to use Hamanaka' s teaching to obtain the invention as specified in claims 1-2, 9, 12-14, 17-18, and 21-23.

4. Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamanaka, as applied above, in view of O'Brien et al. (USPN 6458711, hereinafter "O'Brien").

Hamanaka discloses substantially the limitations of claims 3-4, as shown above. It also discloses [Re claim 4] wherein the step (a) includes a second cleaning step comprising cleaning the semiconductor substrate with HF or DHF solution (see col. 8, lines 7-15).

But it fails to disclose expressly [Re claim 3] wherein the step (a) includes a first cleaning step comprising cleaning the semiconductor substrate with SC1 solution.

However, the missing limitation is well known in the art because O'Brien discloses this feature (See col. 3, lines 40-55).

A person of ordinary skill is motivated to modify Hamanaka with O'Brien to clean undesirable metallic material.

Therefore, at the time of the invention, it would have been obvious to combine Hamanaka with O'Brien to obtain the invention as specified in claims 3-4.

5. Claims 5-7, 10, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamanaka, as applied above, in view of Sumi (USPN 6022805).

Hamanaka discloses substantially the limitations of claims 5-7, 10, and 19, as shown above.

But it fails to disclose expressly the details about the dry etching.

However, the missing limitations are well known in the art because Sumi discloses the use of Ar for sputtering etch with flow rates of 20sccm or 2sccm and power of about 500W, the conditions can vary depending on the amount of oxide to be etched, the exposed features, and acceptable duration (See col.10, lines 3-11 and col. 12, lines 40-49).

A person of ordinary skill is motivated to modify Hamanaka with Sumi to obtain a desired surface oxide etch with damaging the critical dimensions of exposed features.

Therefore, at the time of the invention, it would have been obvious to combine Hamanaka with Sumi to obtain the invention as specified in claims 5-7, 10, and 19.

6. Claims 11 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over, as applied above, in view of Wake (USPN 6725119).

Hamanaka discloses substantially the limitations of claims 11 and 20, as shown above.

But it fails to disclose expressly wherein , the step (c) includes a first removal step of removing the metal film for 5-15 minutes in SPM solution at a temperature of 50-150C and a second removal step comprising removing the metal film for 3-10 minutes in SC1 solution at a temperature of 40-70C.

However, the missing limitations are well known in the art because Wake discloses the etching in SPM and SC1 (APM) (See col. 17, line 57-col. 18, line 38). Wake does not disclose the duration and temperatures. However, it would have been obvious for an ordinary skills to use conventional etchants to etch at a temperature and duration to achieve the cleanness required for a specific process.

A person of ordinary skill is motivated to modify Hamanaka with Wake to use conventional etchants with known characteristics.

Therefore, at the time of the invention was made, it would have been obvious to combine Hamanaka with Wake to obtain the invention as specified in claims 11 and 20.

Response to Amendment

7. In view of Applicants' cancellation of the claim, the rejection of claim 8 under 35 U.S.C. 103 is rendered moot.

Note that Applicants did not have any arguments concerning the features in the examiner' s Official Notice, these features are considered admitted prior art.

Applicant' s arguments' with regard to the rejections under 35 U.S.C. 103 have been fully considered, but they are not deemed to be persuasive for at least the following reasons.

Applicants argued that the cited references do not disclose or suggest depositing a metal film while heating the semiconductor substrate at a temperature of greater thatn 450C. The examiner disagreed, as shown in the above rejection, Hamanaka does teach this feature (see par. bridging cols. 9-10). Note that approximately 450C can be more than 450C, besides a temperature range of from 200 to 500C is also taught.

Applicants argued that no DC power is taught. However any variation in power in the present claims is obvious in light of the cited art, because the changes in power produce no unexpected function.

The routine varying of parameters to produce expected changes are within the ability of one of ordinary skill in the art. Patentability over the prior art will only occur if the parameter variation produces an unexpected result. In re Aller, Lacey and Hall, 105 U.S.P.Q. 233, 235. In re Reese 129 U.S.P.Q. 402, 406.

Note that applicant's arguments are largely directed to what the cited references teach individually. However, it is axiomatic that one cannot show nonobviousness by attacking references individually where the rejection, as here, is based on a combination of references. *In re Young*, 403 F.2d 754, 159 USPQ 725 (CCPA 1968); *In re Keller*, 642 F.2d 413,208 USPQ 871 (CCPA 1981). For example, applicant argues that O' Brien, Sumi or Wake does not disclose depositing while heating as here claimed. However, Hamanaka, not O' Brien, Sumi or Wake, is employed in the rejection to show that feature of the claimed process.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).
A shortened statutory period for response to this final action is set to expire THREE MONTHS from the date of this action. In the event a first response is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event will the statutory period for response expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha T. Nguyen whose telephone number is (571) 272-1678. The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM, except the first Friday of each bi-week. The telephone number for Wednesday is (703) 560-0528.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt, can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ha Nguyen
Primary Examiner

12-8-5